

Student's Motivation Towards A Mathematics Online Magazine

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ABSTRACT: Mathematics is a core subject that need to be acquired and applied by students in real life. However, the teaching and learning of mathematics is still focused on examinations. As a result, students beliefs about mathematics are limited to just numbers, calculations, abstract concepts and meaningless rules. Therefore, there is a need to help students form better views about mathematics that is not confined to classroom walls. One of the recommended ways to achieve this is through multimedia in the classroom as it increases interactivity and helps students to be more independent learners. With this in mind, a mathematics online magazine christened 'Dunia Matematik' was developed to encourage students to view mathematics as recreational, useful and fun. It also attempts to expose students to mathematics in life through its many articles and activities. A third aim of the online magazine was to be a platform for students to interact and communicate about mathematics. The development of the online magazine is based explicitly on an Attention, Relevance, Confidence and Satisfaction (ARCS) Model for Motivation. This study uncovers students' motivation towards the online magazine based on the ARCS Model. Students show good motivation towards the online magazine with exception to their comment and e-forum posting activities and their ability to control navigation of the online magazine. This study has uncovered a future for mathematics online magazine in the classroom so students can connect mathematics with the real world, have an appreciation towards the beauty of mathematics and develop good attitudes towards mathematics as warranted by the Malaysian Mathematics Curriculum.

ABSTRAK : Matematik merupakan subjek asas yang perlu dikuasai dan diaplikasi oleh pelajar dalam kehidupan sebenar. Namun begitu, pelajar memiliki kepercayaan tentang matematik yang terhad kepada nombor, pengiraan, konsep abstrak serta hukum. Fenomena ini menjadi seruan untuk membantu pelajar membentuk kepercayaan tentang matematik yang lebih meluas dan tidak terhad kepada pembelajaran matematik dalam bilik darjah. Salah satu cara untuk mencapai objektif ini adalah melalui multimedia kerana ia membantu pelajar menjadi lebih berdikari dalam pembelajaran. Sebuah majalah matematik atas talian bernama 'Dunia Matematik' telah diilhamkan untuk membantu pelajar membentuk perspektif positif terhadap matematik. Dunia Matematik juga berusaha untuk menunjukkan pelajar tentang matematik menjangkau bilik darjah dan menjadi salah satu platform pelajar boleh berinteraksi tentang matematik. Pembangunan majalah atas talian ini adalah berdasarkan model motivasi ARCS (Attention, Relevance, Confidence, Satisfaction) oleh Keller. Kajian ini berusaha mengenalpasti motivasi pelajar terhadap penggunaan majalah ini berdasarkan Model ARCS. Pelajar menunjukkan motivasi yang baik terhadap majalah ini kecuali pada penulisan komen, e-forum dan kebolehan mengawal navigasi dalam majalah tersebut. Kajian ini menunjukkan aspek yang boleh diperbaiki dalam pembangunan majalah ini. Namun begitu, masa hadapan majalah atas talian masih boleh dijadikan sumber rujukan matematik di luar bilik darjah dan membentuk cinta serta sikap yang positif terhadap matematik seperti yang disarankan dalam kurikulum matematik malaysia

1.0 INTRODUCTION

In today's world, mathematics is a core subject that needs to be acquired and skilfully applied by students (Akinsola and Olowojaiye, 2008). Mathematics is powerful because it can instil problem solving skills, reasoning, logical and critical thinking. However, it is also well known that in common teaching practice the habit of connecting mathematics classroom activities with real world experience is still substantially limited to word problems (Bonotto, 2001).

As a result, students' mathematics knowledge is sparse, limited to just calculation, schools and examinations. Students view mathematics as synonymous with arithmetic and think that it is better to know only one way of problem solving so they do not have to memorize other methods (Spangler, 1992). Students see mathematics only as memorizing algorithm rather than understanding the theory (Schoenfeld, 1992, Shackow and Thompson 2005) and perceive it as a difficult subject; largely bounded by sets of abstract rules and symbols which give no meaning (Norton and Irvin, 2007). There is an indication that they know mathematics is an important subject but, students still do not want careers that involve the discipline (Shackow and Thompson 2005). This is perhaps due to students' beliefs that mathematics careers are limited to just accountancy and managing inventory (Spangler, 1992).

A research by Lazim *et al.* (2004) on students' beliefs towards mathematics revealed that students hold strong beliefs that the teachers play a major role in contributing to their interest in mathematics. Furthermore, the students highly perceive that 'drill and practice' is an important element in learning mathematics. Many students also lack perseverance in spending time understanding a new concept or in problem solving (Fan *et al.* 2005). Students in an undergraduate statistics course believe that they can perform well in the course, but wish that statistics will not be used in the workplace (Evans, 2007).

Beliefs about mathematics can determine how one chooses to mentally construct the whole idea about mathematics (Lazim *et al.* 2004). The subjective beliefs students hold about mathematics, about their abilities in mathematics and the mathematics class context are in close interaction with each other (Di Corte and Eynde, 1996). As a result, students' beliefs about mathematics can influence their emotions and behavior towards mathematics, thus develop a poor attitude towards the subject.

Despite the National Integrated Curriculum for Secondary Schools (KBSM) objective to develop positive attitudes about mathematics through an appreciation of its beauty and strengths, it is clear that students hold beliefs about mathematics which are inconsistent with the intended curriculum. There is a need to help students develop beliefs about mathematics that are broad and unconfined to the classroom. Students need to have beliefs that mathematics is not just about calculations and numbers. It is neither for entry level examinations nor just sets of drill and practice sets. Instead, students need to be exposed to mathematics evident beyond the classroom, its presence in everyday life and its many roles in problem solving. They also need to be shown mathematics that is recreational, interactive, useful and fun.

The use of online tools and multimedia can assist in developing better beliefs about mathematics due to its many advantages. According to Jamaluddin and Zaidatun (2003) multimedia in teaching and learning encourage students to think critically, solve problems, develop skills in finding and organizing information, and be motivated in the classroom. It also prepares students with knowledge and skills required for their future careers (Robyler and Edwards, 2000; Jonassen *et al.*, 1999). The use of online tools moves students from being independent of textbooks to gaining knowledge from other sources. It also helps develop independent learning and support lifelong learning among students.

An array of tools is available to aid in the teaching and learning of mathematics that is interactive and fun. Out of the many, the online magazine is chosen to help students develop better beliefs about mathematics because it has the power to portray information in a recreational but structured manner. Online magazines have many advantages in which articles can be published and instantly accessed throughout the world, include search mechanism and promote interaction between readers in the e-forum and comments. Nonetheless, its biggest advantage is its ability to integrate various types of media such as audio, video, and 3-dimensional objects into its articles (Von Berg and Pralle, 1999). Due to online magazines' much strength, a mathematics online magazine, Dunia Matematik was developed to help students acquire better beliefs about the power and functionality of mathematics in life.

2.0 RESEARCH OBJECTIVE

A mathematics online magazine was developed to encourage students to view mathematics as recreational, interactive, useful and fun. It also attempts to expose students to mathematics in life through its many articles and activities. A third aim of the online magazine was to be a platform for students to interact and communicate about mathematics. As part of a larger research on improving attitude towards mathematics, the aim of this study is to determine

- i. Students' attention towards the online magazine
- ii. The relevance of the online magazine to students
- iii. Students confidence towards the online magazine
- iv. Students' satisfaction towards the online magazine

2.1 The ARCS Model For Motivation And The Online Magazine

Motivation is viewed as highly unpredictable and changeable, subject to many influences over which the teacher or designer has little control (Keller, 1987). Motivation to learn is highly personal and very much depends on the individual. However, motivation can also be influenced by external factors (Frith, 1997). Extrinsic motivation can be provided through embedding into instructions strategies that can enhance learner's attention to the materials and perception of relevance, confidence and satisfaction about learning from them and in the end improve cognitive performance (Means *et al.* 1997). This is exactly what the ARCS (Attention, Relevance, Confidence, Satisfaction) model attempts by providing instructors with guidelines on embedding external motivation into their classes. As an effort to provide a tool for teachers and students to develop better beliefs about mathematics, an online magazine was developed based on the ARCS model by Keller (1987).

The first condition, Attention focus on gaining attention and sustaining it through participation and concreteness. Participation is the use of materials that require student participation through comment posts, e-forum, games, survey and quiz. Concreteness is the use of examples that involves real life where the online magazine consist of articles that expose mathematics in life. The e-forum, articles and comment boxes play a large role in helping students gain a broader sense of mathematics. According to Spangler (1992), open ended questions and giving opinions such as in the e-forum and comment boxes bring students' beliefs to a conscious level. As students discuss their responses, some students' beliefs will be

challenged, leading to an examination of their beliefs and a possible modification of these beliefs.

The second condition is Relevance which serves to meet learners' individual needs and goals, and help the development of one's positive learning attitude (Lai *et al.* 2002). Some strategies in relevance are through future usefulness and need matching. According to Keller (1987), future usefulness is to state explicitly how the instruction relates to future activities of the learner; needs-matching is to meet the needs of learners and choices is to provide personal choices for organizing one's work. The online magazine does not state explicitly how the content is useful for their future, but students' will be able to find its usefulness when experiencing the online magazine. The online magazine meets the learners' needs by creating a suitable environment for them to learn about mathematics.

The third condition is Confidence where students build confidence by taking part in activities and enjoy what they are learning (Keller, 1987). Strategies for this include increasing the difficulty of mathematics questions provided in the quiz section, playing with the online mathematics games and being involved in the e-forum. Students' confidence to the online magazine's stability, security and their control over navigation of the online magazine is also included.

The final condition is Satisfaction where students' are satisfied with their accomplishments in a course (Keller, 1987). This includes providing timely feedback for students' work where it reinforces positive feelings of personal effort and provide satisfaction in their work (Feng and Tuan, 2005) This is provided in the magazine through feedbacks in the quiz, games, and their comments in the online magazine. It also promotes active participation in work and help in students' learning (Wang, 2008).

2.2 Structure Of The Mathematics Online Magazine

The online magazine can be reached at <http://mathed.utm.my/duniamatematik>. The magazine has been successfully established since January 2008 and its content is updated once a month by the team of writers and editors. It runs on a combination of the Content Management System, Joomla and the Learning Management System, MOODLE.

The content of the magazine is constantly revised and updated and has undergone several changes ever since it was established. During its first year running, there were only eleven sections provided for readers. The sections are Focus, Current Issues, Arts, Statistics, History, Influential Figures, Careers, Application, How to Learn Mathematics, Games and Quiz. There is also a past issues section, e-forum and a survey box at the end of every article. Now, it has expanded to Did You Know?, Mathematics Applications and Mathematics Software article sections. The quizzes provided are for secondary school and primary school students.

These content are designed to help students gain better beliefs about the role of mathematics in life and in many events. It also aims to help students see the functionality of mathematics in solving problems, how mathematics can represent many aspects of our lives and its presence in nature and art. Diagram 1 is a simple depiction of each section of the online magazine and the content portrayed in terms of beliefs about mathematics.

3.0 SAMPLING, RESEARCH DESIGN AND DATA ANALYSIS

15 students used the online magazine for 10 weeks, 2 hours each week. They experienced the online magazine after school so as not to disrupt their class schedule. Students' took part in writing comments, online games, mathematics quiz, survey and e-forum activities. They answered a five point likert scale questionnaire consisting of 28 items of their motivation in using the online magazine with reliability, cronbach alpha = 0.945. The questionnaire consists of items that measured students attention, confidence and satisfaction towards the online magazine based on the likert scale. It also measured the relevance of the online magazine to students. The quantitative data is analyzed through the proportion (number, percentage) of responses for each item. The researchers' role throughout the data collection was as a facilitator to help students if they come across difficulty during navigation and taking part in the activities provided in the online magazine. For each meeting students' were required to read and give comments to at least three articles and play with the online games. In two meetings, students were directed to answer the quizzes provided.

4.0 RESULTS AND DISCUSSION

For the component attention, students identified the online magazine exposes mathematics beyond the classroom (15 agree, 100 percent), provides a lot of information about mathematics (14 agree, 93 percent) and that it motivated them to learn mathematics (12 students, 80 percent). In terms of activities and participation within the magazine, students found the online games fun (14 agree, 93 percent). The number of quiz questions provided is adequate (12 students, 80 percent) and the items are tricky (14 students, 93 percent). Students had played with the online games in every meeting and attempted the quizzes thrice within the ten weeks of treatment.

Some mixed reactions are observed in comments and e-forum activity. The two activities are similar where students share their experiences and ideas about articles in the comment activity and students discussed several issues that are brought forth in the e-forum. The responses indicate that students agree that the e-forum lets them share experiences about mathematics (14 agree, 93 percent) and that they liked exchanging their opinions (13 students, 87 percent). Also, 12 students agreed that the e-forum helps them build confidence (12 students, 80 percent) but, only 11 students (73 percent) said they were comfortable discussing in the e-forum. This could mean that students acknowledge the e-forum's function for mathematics discussion but, this did not mean they are comfortable in participating.

Students' feedback to the comments activity show paltry responses where five students indicated they did not like to give opinions on the magazine's articles and two students (13 percent) said they did not like it when friends responded to their comments of the articles. The comments activity was a large part the online magazine's activity as every article read included a comment box to be filled. Students had read and gave comments to at least twenty articles during the ten week span, and did so obediently. Their declaration that they did not enjoy doing so could mean that compliance to an activity in the classroom does mean that students enjoy the said activity. It may also mean that reading and giving opinions is not an engaging activity to the five students.

For relevance, students agreed that the online magazine is useful (14 students, 93 percent), suitable (13 students, 87 percent) and helps them to learn mathematics (13 students, 87 percent). The students also agreed that the online magazine helps them choose careers that are suitable (13, 86 percent).

Students are confident that the online is stable to be used (12 students, 80 percent) and 13 students (87 percent) agreed that the use of username and password gives them security when using the online magazine. However, six students (40 percent) alleged that they had problems in navigating the online magazine and seven students (47 percent) indicated they do not have control of the online magazine. In several meetings, the internet line was problematic, thus there were difficulties in navigating the online magazine and limiting students' control over the online magazine.

For satisfaction, students agreed that the online magazine is fun to use (13 students, 87 percent) and the presentation is appealing (12 students, 80 percent). Students' also like to learn mathematics through the online magazine (12 students, 80 percent) and claim that they will use the online magazine in the future (12 students, 80 percent).

The study uncovered that the online magazine provided many activities that require students' participation such as the online games, the quizzes and the comment boxes. Positive responses were observed for student participation in games because online games are engaging and fun. Ke (2008) indicated that game based mathematics showed significant effect on the affective learning outcome. More importantly, cooperative game based learning indicated a positive effect on students' affective learning. Game play also increased students' motivation in learning mathematics (Lopez-Morteo and Lopez, 2005).

The online magazine's strategy to include formal assessments in the form of mathematics quizzes was effective in helping students revise mathematics they had learnt. Online assessments such as quizzes provide many advantages to students. Their advantages are formative assessments encourage active participation among students, and that feedback as provided in the quizzes helped students' learning (Wang, 2008).

This study also revealed that some students may be discomforted discussing in the e-forums and comment boxes. Though open ended questions and giving opinions such as in the e-forum and comment boxes bring students' beliefs to a conscious level (Spangler, 1992), many students are still reluctant to talk about mathematics (Lazim *et al.*, 2004). Another view could be that reading and writing is no longer considered an engaging activity for students of today. They may view reading, writing and commenting as a boring and isolated task. Students had received little or no feedback from their posts and this may contribute to the task being dull. According to Feng and Tuan (2005), focus on providing feedback and other information that reinforces positive feelings for personal effort can provide satisfaction in student activities.

The online magazine is relevant to students' needs in terms of it being useful; aids them in learning mathematics and helps them choose suitable careers. According to Shellnut *et al.* (1999) relevance is to relate the content to personal needs and is a major factor to sustain students' motivation in a course. Relevance is also an important predictor of learning outcomes and enhances meaningful performance in the classroom (Means *et al.*, 1997).

The online magazine's stability is held through the use of username and password. Instead of anonymity, it gave students security within the online magazine. However, less confidence in terms of control where students found it difficult to navigate the online magazine. This could be due to internet connection problems where sometimes the pages took a long time to load and there were problems in posting comments and submitting quizzes. Despite problems in internet connection, students still agreed the online magazine was fun and appealing. They also agreed they would use it in the future.

5.0 CONCLUSION

This study's main goal was to assess students' motivation towards a mathematics online magazine based on the ARCS model for motivation. The development of the online magazine took into account each condition of the ARCS Model within its content. The ARCS Model provides extrinsic motivation and assumes that strategies embedded in instructional materials can enhance the learner's attention to the materials and perception of relevance, confidence and satisfaction about learning from them (Means *et al.* 1997). The online magazine's main goal is to help students' gain a more comprehensive view of mathematics and provide online activities that enables students' to communicate about mathematics.

The responses from students had helped the developers identify the online magazine's strengths such as the inclusion of games and quizzes within the online magazine. However, more effort need to be done by the team of writers and editors to provide relevant and fast feedback of comment and e-forum posts. This research was also conducted as an extra-curricular activity therefore, there is a need to find out the responses of students if the online magazine is integrated into the classroom.

Based on this research, the use of online magazines to help students' gain better beliefs about mathematics and be able to communicate about mathematics seem to have a future in the classroom. It is inline with the malaysian mathematics curriculum goal to instil an appreciation of mathematics, connecting mathematics with the real world, and also developing good attitude towards mathematics.

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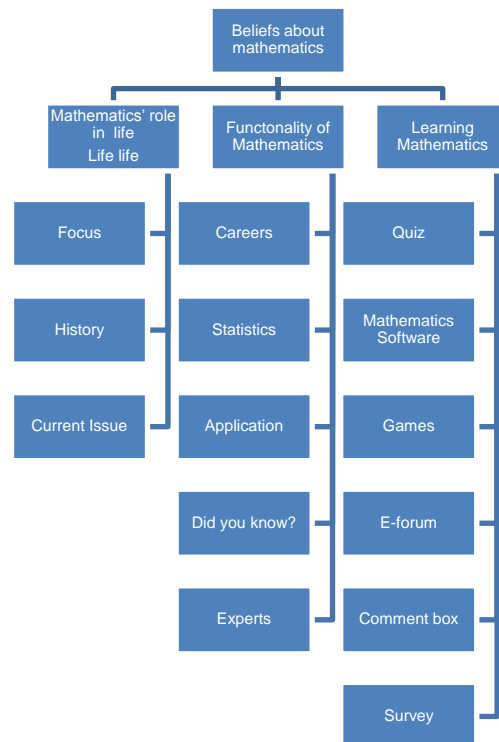


Diagram 1: each section of the online magazine and the content portrayed in terms of beliefs about mathematics